DOCUMENT RESUME

ED 083 720 EA 005 561

TITLE	Report of CEC Study Committee on Construction Management.
INSTITUTION	Consulting Engineers Council of the U.S., Washington, D.C.
PUB DATE	Jan 72
NOTE	35p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Construction Management; *Construction Programs; *Consultants; Contracts; Definitions; Educational Facilities; *Management Systems; Marketing; *Occupational Information; Task Analysis; Trend Analysis

ABSTRACT

Changing times place new demands on those involved in the implementation of construction projects. Within a relatively few years, the size and complexity of projects has grown substantially. Environmental and other public and social considerations are increasingly significant. With growing complexity, the requirements for effective project management and control of schedule, cost, and quality have also multiplied. The use of multiple construction materials and equipment contracts has flourished in order to phase construction, compress schedules, and improve performance. In short, the task of achieving the objectives of construction projects has become more difficult. As a result, there has been significant re-evaluation and experimentation with the roles and scopes of service provided by the various organizations involved in construction projects. The traditional roles of the owner, architect-engineer, and contractors have too frequently failed to achieve desired results. Wide variations in these traditional roles have been tried in varied circumstances with mixed results. From this experimentation, reasonably well-defined roles for the project manager, design manager, and construction manager are emerging. These professional service roles, properly executed, provide the means for improving overall performance of the project and construction team. They also afford an opportunity for expanded professional service to clients by consulting firms. (Author)

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ED 083720

REPORT

of

CEC STUDY COMMITTEE

on

CONSTRUCTION MANAGEMENT

January, 1972

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CONSTRUCTION MANAGEMENT

I - INTRODUCTION

Background

This report has been produced in response to a request of the Executive Committee of CEC/USA at the 1971 Annual Meeting of the Council in Hollywood, Florida. An Ad Hoc Committee was appointed to examine and make recommendations regarding project management and construction management services that might be provided by independent consulting firms. The committee was charged with the collection and study of available information and development of guidelines and recommendations which would be useful to independent consulting firms.

Throughout this report, reference is made to "consulting firms." This terminology is intended to include any firm whose practice entitles it to membership in CEC/USA. It may also include many architectural firms and other types of independent professional consulting firms.

Changing Situation

Changing times place new demands on those involved in the implementation of construction projects. Within a relatively few years, the size and complexity of projects has grown substantially. Environmental and other public and social considerations are increasingly significant. With growing complexity, the requirements for effective project management and control of schedule, cost and quality have also multiplied. The use of multiple construction materials and equipment contracts has flourished in order to phase construction, compress schedules, and improve performance. In short, the

task of achieving the objectives of construction projects has become more difficult.

As a result, there has been significant re-evaluation and experimentation with the roles and scopes of service provided by the various organizations involved in construction projects. The traditional roles of the Owner, Arthitect-Engineer, and Contractors have too frequently failed to achieve desired results. Wide variations in these traditional roles have been tried in varied circumstances with mixed results.

From this experimentation, reasonably well defined roles for the project manager, design manager, and construction manager are emerging. These professional service roles, properly executed, provide the means for improving overall performance of the project and construction team. They also afford an opportunity for expanded professional service to clients by consulting firms.

II - DEFINITIONS

The Problem of Terminology

In discussing project management, design management, and construction management services, there are major difficulties in terminology. This is evident from seminars, publications, and informal discussions. There are a wide variety of functional activities involved in conceiving and implementing a construction project. This problem is compounded by the fact that any of these functions may be performed by a variety of different entities, including the Owner, independent consulting firms, Contractors, and turn-key organizations.

As an approach to the definition problem, a functional definition of three different positions commonly involved in construction projects has been developed. These are intended to identify function independent of the organizational entity that may perform the function.

Functional Definitions

The following three definitions identify the professional functions involved in implementation of construction projects.

Project Manager. The Project Manager directs the efforts of both the Design Manager and the Construction Manager, with particular emphasis on assuring that Owner needs are defined and met. In addition, he normally directs other services not included within the scope of activities of the Design Manager and Construction Manager. These may include pre-feasibility and feasibility studies, site selection, real estate analysis and selection, financing, accounting, tenant and leasing activity. In many of these areas of concern, other assistance may be required. For example, a sizable undertaking might have a real estate manager, a financial manager, etc.

Design Manager. The Design Manager is the manager providing direction of the design effort, including a basic scope of services frequently called "architect-engineer services." This scope of services is similar to that identified in a number of standard contract document forms, including the CEC Standard Form of the Engineer-Owner Agreement, AIA Owner-Architect Agreement, and others. This scope includes schematic design, design development, preparation of construction documents, assistance in bidding or negotiating, and limited consultation during the construction phase including periodic visits and shop drawing review. It excludes resident services and other "additional" services. This is a traditional scope of services generally well understood by the industry.

Construction Manager. The Construction Manager directs a rather wide spectrum of construction management services which complement and augment the services directed by the Design Manager. Those services directed by the Construction Manager are professional services. The Construction Manager does not do construction and is not in the direct contract tier between Owner and the Contractors.

The Construction Manager's services commence at the same time as the Design Manager's services. While design is underway, the Construction Manager provides the following services:

1. Input to the design process, including review of plans and specifications with respect to constructibility and value analysis.
2. Cost control, including quantity and cost estimates, value analysis and monitoring of design from a cost standpoint.

3. Recommendation on arrangement and scope of construction and equipment purchase contracts, with attention to long lead time items, construction trades, and similar matters. Construction contracts are reviewed for adequate handling of interface problems.

4. Overall attention to scheduling and expediting.

5. Review of general conditions and bid documents to assure consistency with constructibility considerations, job site facility requirements, and similar matters.

As soon as construction and/or equipment contracts are awarded, the Construction Manager, working as the Owner's Agent, provides general coordination and direction of the work of the various contractors. This may include such items as:

1. Purchasing and contractual arrangements.

2. Quality control, including on-site and factory inspection.

3. Schedule monitoring and expediting as needed to identify hazards to timely completion and initiate steps to correct difficulties which may occur.

4. Cost control, including continuing monitoring of costs.

5. Recommendations regarding labor relations and safety. (These do not relieve Contractors of their responsibilities.)

6. Maintenance of necessary job site records, including progress reports, unit costs, change orders, as-built information, etc.

7. Handling of progress payments, field changes and claims.

8. Final inspection.

9. Start-up and testing of the facilities.

With these functional definitions, the roles of the Design Manager and Construction Manager are at the same level. Neither has authority to direct the other. Both require effective interface activity with the other for successful completion of their functions. The Project Manager is the overall manager of the project and has authority to direct the Design Manager, the Construction Manager and others who may be involved in other areas.

Excluded from the functional definitions above are the functions of construction contractors and equipment or materials suppliers. Contracts for these activities are directly between the Owner and the Contractor or supplier involved.

Variations

A number of variations of the functional arrangement described previously are used. For example, while the normal construction management approach involves use of multiple construction contracts directly with the Owner, the Owner sometimes desires to have a single prime contractor involved in the entire project, with all other construction contracts and materials and equipment supply contracts written as subcontracts to the prime contractor. This approach normally requires that the prime contractor be selected at the beginning of the project. It raises questions on the extent to which the prime contractor will be allowed to bid or negotiate for any of the succeeding subcontracts. In such cases, the prime contractor often performs a portion of the Construction Manager's functional duties, particularly those related to cost control, labor relations, expediting, and safety.

Another variation is that of the current GSA approach to construction management wherein the Construction Manager is required to be available to perform some of the "general conditions" construction activities such as watchmen, scaffolding, toilets, fencing, first aid, safety facilities, etc. Such items could be handled equally well by a general contractor working under the general coordination and direction of the Construction Manager.

Trends

Knowledgeable members of the construction industry will recognize that many aspects of project management and construction management are not new. Many, if not all, of the functions described above have been performed for many years, perhaps with different names and emphases.

The new aspect of project management and construction management services is their emergence as a part of a systematic management approach to project implementation.

A number of federal government agencies, including the Corps of Engineers and the General Services Administration, are using a project management and construction management approach. GSA, for example, utilizes outside agencies for the design management and construction management functions and performs the project management function with GSA staff.

A significant number of industrial organizations and utilities are using project management and construction management services. Their practice in terms of function, level of effort, and organizational assignments varies widely.

Project management and construction management services are also the center of much discussion within the construction industry. Seminars, conferences, and publication on these and related areas are proliferating.

A definite trend toward greater use of project management and construction management services is apparent.

Performing Entity

The functions of Project Manager, Design Manager, and Construction Manager have been performed by many different types of organizations.

Most Owner organizations perform some portion of the Project Manager function internally with their own staff. Some Owner organizations have extended internal capability to include design and Design Manager function. Others have extended further to include some or all of the Construction Manager function, and still others perform much of their own construction directly and are highly self-sufficient in implementation of construction projects. The practicality of in-house capability for Owner organizations depends on numerous factors including general philosophy, volume of project activity, recurring nature of projects, uniformity of project activity both as to type and amount, and availability of outside services, all of which have economic implications.

Most professional consulting firms provide a substantial portion of their services in the design and Design Manager area. Some have extended their capability to include many of the Project Manager functions, particularly those relating to feasibility, site selection and financing. Some have capabilities that include the Construction Manager functions. The decision to build capability in Project Manager and Construction Manager functions is related to philosophy, opportunity to provide such services, and various economic factors.

Construction contracting organizations also vary in capability. Some, primarily general contractors, have moved from their role as prime contractor to develop capabilities in some or all of the functions of the Construction Manager. Some have added design capability to their organizations resulting in a design-construct or turn-key company. Some have developed capability

in a limited number of Project Manager functions. Again, philosophy, opportunity and economics are the critical determinants.

Other kinds of organizations are also providing services in the functional areas enumerated. A number of real estate development organizations have expanded their capability to include project management and construction management. A wide variety of specialized consultants practice in many of the functional areas described.

Hence, the variations in actual practice are infinite. In discussing various methods of implementation of construction projects, it is necessary to identify both function and organizational entity in order to be sure that the approach is understood. Precise definition is difficult, but the three functional roles of Project Manager, Construction Manager, and Design Manager seem to be emerging from general practice.

Task

In applying project management and construction management services to any particular engagement, the task is that of identifying the needed functions, establishing the level of effort appropriate to each function, determining what organizational entity should provide services required for each function, and developing contractual relationships between the participating organizations so that the total project implementation team will function effectively and efficiently.

The Owner is the ultimate decision maker in this task. He has the ultimate authority to assemble the project implementation team which will, in the last analysis, make the difference as to whether the project is successful.

In making these decisions, the Owner can seek advice and assistance from consulting firms and other organizations which might be potential members of a project implementation team. However, separate and apart from any advice, the Owner must be satisfied that the necessary functions have been identified and will be handled properly by the project implementation team.

III - MARKET OPPORTUNITIES

Opportunities for Consulting Firms

Independent consulting firms have the opportunity to provide project management and construction management services in addition to their more usual design related services. Efforts of consulting firms in these areas will not be unchallenged. Owner organizations will continue to provide some of these services. Consulting firms will face substantial competition from general contractors for construction management services, and from design-construct or turn-key organizations for project management and design management services.

However, unless reasonable numbers of consulting firms provide competent project management and construction management services, these service areas will be abdicated to others.

The ultimate test of any service or product is the marketplace. Hence, the real measure of consulting firms' project and construction management services is the extent client organizations use them. This is governed by whether such services are effective in meeting client needs and achieving desired results.

It is imperative that consulting firms offering project and construction management services do so competently. Inept services will be found wanting in the marketplace and will tarnish the reputation of both the service and the firm. Only competent project and construction management services can meet today's complex demands.

Advantages

Project management and construction management services rendered by independent consulting firms offer a number of advantages which make them attractive to Owners. These include:

1. The Owner is assured of professional independence. The firm or firms providing project management, design management and construction management services to the Owner are independent of and have no direct financial interest in the construction materials or equipment contracts. Hence, their prime objective is serving the Owner's needs and they have no conflict of interest with this objective. In the implementation of any project, questions and differences of opinion inevitably arise which involve the Owner's interests. His interests are most effectively protected by having competent and independent management and construction expertise available to him.

2. The Owner can assign the total professional responsibility to a single organization of he chooses. Many multiple discipline firms have in-house capability to provide all services required for project management, design management, and construction management. Alternatively, several firms may associate to carry the professional responsibility.

3. The approach is highly flexible to meet specific Owner and project requirements. If the Owner possesses some, but not all, of the professional capability required to provide project management, design management, and construction management services, the needed additional capability can be obtained from professional consulting firms. It is not at all unusual for the Owner to provide some part of the services in one or more of these areas. Frequently, Owner personnel and consulting firm personnel are merged into an integrated project team organization specifically adapted to project needs and Owner requirements. Traditional approaches to the implementation of construction projects do not offer this flexibility.

4. The Owner obtains improved schedule performance. Multiple construction, materials, and equipment contracts are inherent in the concept and they can be phased and overlapped with design efforts, a process sometimes called "fast track." On sizable projects, upwards of 50 or 60 different contracts for construction and furnishing of materials and equipment may be utilized.

5. The systems approach to construction is facilitated. The use of numerous contracts for construction, equipment, and materials permits packaging of contracts consistent with specific building or process systems and subsystems which can then be purchased on a performance specification basis. With phased construction and design, the purchase of specific systems can predate completion of design. This permits the final design drawings to be based on the actual systems purchased, resulting in more complete plans and specifications and a better bidding situation.

6. The Owner obtains stronger management of the project. Increasingly, the problems of project implementation are those of management of the many functions and activities involved rather than those of a technical nature. This requires sound integrated management from start to finish, with heavy emphasis on items such as scheduling, cost control, purchasing and expediting. Project and construction management services provide this additional effort and emphasis.

7. Competent construction oriented input is provided to the design process. The construction manager and his staff are primarily oriented toward construction rather than design. With effective

interfaces between them and the design manager and his staff, the design process will produce improved constructibility, minimizing construction problems and reducing costs.

8. The Owner has greater assurance of quality control. The construction orientation of the construction manager and his staff, the increased level of effort devoted to quality assurance, and the professional independence of this effort encourage quality.

9. Costs are reduced. A number of factors are operative. First, the various contracts for purchase of equipment and materials and construction are fully definitive as to the amount of work included. They do not need to be awarded far in advance of the time the work is to be done. This reduces the Contractor's risk as he bids, minimizing the costs.

Second, each contract can be awarded by competitive bidding, meeting legal requirements in some cases and assuring competitive pricing.

Third, numerous smaller contracts rather than a few large contracts are used. This means that more contractors are able to bid each of the contracts because the size falls within their capability. It avoids bidding restrictions on extremely large contracts because of limited contractor financial or management capability. In addition, each contractor assumes only the risk of his own work rather than having to assume risk involved in numerous subcontractors. Again, the bidding situation is improved.

Fourth, the schedule compression possible with this approach minimizes cost increases due to inflation. Particularly with the rapid rates of inflation experienced in recent years, acceleration

of construction work can have a significant effect on the costs involved.

Finally, the increased cost of professional service with this approach is more than offset by the elimination of prime contractor mark-up on the various subcontracts. With this approach, the construction management services fee may be in the order of 3% to 5% of the total construction cost which is significantly less than normal prime contractor mark-up on the work of subcontractors.

In short, consulting firm project and construction management services offer many advantages to the Owner.

Construction Cost

Discussion is appropriate on construction cost. On any project, the actual construction work involved is defined more and more precisely as the project proceeds from early conceptual stages through final completion. A generalized estimate of construction cost at the schematic design stage is necessarily less precise than a detailed estimate based on detailed design plans and specifications. This, in turn, is somewhat less precise than the final cost at completion of construction because of the possibility of unforeseen field changes, etc.

With the construction management approach, cost control is maintained throughout the evolution and development of the project. Beginning with the earliest conceptual estimates, costs are assigned to each major element of the project. As design proceeds, the cost assigned to each work element becomes progressively more firm. A step increase in certainty occurs each time an element of the project is placed under contract for construction. More

and more of the construction elements gradually move from the status of estimate to that of contract amount. As the level of certainty increases, the amount allocated for contingencies can be reduced.

Danger signals are apparent whenever costs for any element deviate from previously established amounts. If this occurs, appropriate design adjustments or other corrective actions occur. In addition, the phased system of contracts can provide for bid prices on a significant portion of the work before final commitment to proceed with any of the construction or purchase contracts. Thus, this approach assures the Owner of cost control, but he does not normally have a guaranteed "upset" construction cost amount. Cost assurance rests on the efficacy of the control system and the competence of the project, design, and construction management team.

It is, of course, possible with some types of turn-key arrangements to fix or guarantee the construction cost to the Owner at a somewhat earlier stage than it normally becomes fixed with the construction management approach. The primary advantage to the Owner of early fixing of construction cost is that he then has passed a significant part (though not all) of the risk involved in further definition of the project along to the turn-key contractor. Fixed price turn-key contracts normally have escape clauses freeing the turn-key contractor from cost responsibility under circumstances beyond his control such as unforeseen site conditions, scope changes, force majeure, etc.

However, there are also disadvantages to early, and perhaps premature fixing of construction cost. First, the Owner pays a price for transference of risk to others. The better the project definition at the time construction cost is fixed, the less will be included for unforeseen risks. Second, it is fundamental that scope is fixed concurrently with cost. As soon as the Owner fixes some or all of the construction cost by contract, he foregoes flexibility

in further development of that work. Of course changes can be handled by constract amendment, but this is seldom as satisfactory as the initial bidding or negotiation.

Finally, if the construction cost is fixed before sufficient details of the project are known and defined, the scope of work will be imprecise, allowing considerable latitude in what is actually furnished. The Owner's protection lies in the degree of precision with which the scope of the contract work is defined. A fuzzy definition, coupled with a fixed price, leaves room for compromise of the Owner's interests.

In this connection, it is significant that many turn-key contractors prefer to work on a contractual basis which does not fix construction cost at the outset, but rather fixes it with about the same schedule as the construction management approach. Many different types of contractual arrangements are used with the turn-key approach and the efficacy of many of them depends upon the accuracy of early cost estimates. If such estimates are too high, the end result works to the advantage of the Contractor.

The proper time and procedure for setting construction cost amounts is much debated and discussed. No one solution is universally applicable. However, in many, if not most situations, the flexibility and cost control effectiveness of the construction management approach provides significant advantages to the Owner as compared with alternative methods. Consulting firms experienced in construction management work have a demonstrated record of cost control performance and this is a qualification of prospective consultants which should be reviewed by Owners prior to selection.

Applicability

It must be recognized that the project management and construction management approach is not universally applicable. For example, comparatively small

and straightforward projects with a comfortable schedule continue to be satisfactorily handled by the traditional approach. In such projects, it is satisfactory for the design to be completed in one package prior to commencement of construction and for the construction to be handled by one or a very few prime contractors. The project management requirements on such projects are generally less demanding.

The selection of the optimal approach for handling of any particular project involves trade-offs in advantages and disadvantages. The project management and construction management approach offers many advantages, particularly for sizable projects, complex projects, and projects with tight schedules. The high flexibility of this concept allows it to be tailored to nearly any particular situation.

IV - CONSULTING FIRMS AND PROJECT AND CONSTRUCTION MANAGEMENT SERVICES

General

Consulting firms are uniquely qualified to provide project and construction management services. They have a tradition of professional independence. They have been associated with projects from the early conceptual stages through completion of construction. Although most consulting firms have centered their services in design areas, many have developed substantial capability in project and construction management services. Nearly all have worked closely with Owners in the accomplishment of these aspects.

Consulting firms are tending to become larger in size and to place increasing emphasis on the development of multiple discipline capability. These trends are consistent with development of the disciplines and capability required to handle project and construction management services.

Some consulting firms can assume the responsibility for project and construction management services with only little or no addition to capability or change in the firm's organization. However, those practicing in limited or specialized disciplines must add considerable expertise and staff to assume this responsibility.

It must be emphasized that development of capability to handle project management and construction management services is not a simple task. It poses technical and economic difficulties. It is an undertaking which should be viewed in the same context as that of adding new disciplines to an existing firm and should be done in consonance with long-range planning. Consulting firms which endeavor to provide project and construction management services without adding or developing the requisite additional disciplines and capability run a high risk of substandard performance.

Project and construction management are services that will not and should not be offered by all consulting firms. Each firm must decide whether it is interested in offering these services. If the firm elects to do so, the requisite development programs should be planned and implemented.

Subject to these limitations, it is the unanimous opinion of this committee that project and construction management services are appropriate services to be provided by consulting firms, and that those firms which have or are willing to develop the necessary capability to render competent services should do so.

Competitive Position

Those consulting firms which elect to provide competent project and construction management services will improve their competitive position with respect to other professional and non-professional competitors.

While project and construction management are not universally applicable, they are a very desirable means of handling many projects. Firms able to provide such services will augment their market position as compared with consulting firms without such capability.

Similarly, the ability to provide these services places the professional consulting firm in a much stronger competitive position as compared with turn-key and design-construct organizations. As discussed previously, the project and construction management approach affords the Owner many of the advantages, but not the disadvantages, of the turn-key approach. Again, this places consulting firms with such capability in an improved market position.

Consulting firms with project management and construction management capability will also tend to improve their performance on conventional A/E services. Increased capability in matters relating to constructibility, scheduling, cost control, and similar areas will strengthen overall performance of the firm, even when such services are not a primary component of the work being performed.

Ethical Considerations

The basis of all ethical considerations for professional consulting firms is the interests of the client and the general public. The CEC Code of Ethics has been developed as an expression of this principle.

The offering of project and construction management services by consulting firms is totally consistent with the CEC and other professional society Codes of Ethics.

However, there are two areas of concern which may or may not be significant factors in the future. First, project and construction management services are not yet universally accepted as professional services with selection and negotiation of fees on a professional basis. The present GSA selection procedure involves selection of several firms on the basis of qualifications followed by submission of precise fee data as a factor in final selection.

If selection of firms providing project management or construction management services is administered in a way that price becomes the primary consideration in selection, the Owner's interests will, in the long run, be jeopardized. Project management and construction management services are professional in nature. Scope and level of effort cannot be defined precisely,and undue price emphasis will cheapen the quality of service.

Consulting firms offering project management and construction management services should endeavor to educate clients to the professional nature of the services and the fact that the Owner's interest will best be served by professional selection procedures.

A second area of concern is the possibility that some general construction work may be included in the scope of construction management services. This, too, is currently the case with GSA. In order to maintain professional independence from the construction work, it is desirable that the construction manager, along

with the project manager and design manager, be financially separated from any direct construction effort. This can be accomplished by inclusion of "general conditions" work in the scope of work of one or more of the construction contractors on the project. Again, educational efforts are required.

In keeping with recent developments with respect to ethical practices, each individual firm must develop its specific policies related to the two problem areas described. The concepts of professional independence and professional selection are valid, and sound educational efforts in this direction will ultimately be effective.

Liability and Insurance

Each firm offering project management and construction management services should carefully review its liability and insurance situation with competent legal and insurance counsel.

Project and construction management services are an extension of professional design services. So long as the consulting firm provides only professional services in its normal professional fields, its liability position for project management and construction management services is little changed from that for design services. That is, the firm is responsible for its own activities and for negligent errors and omissions in these activities.

Project management services are unlikely to increase the consulting firms' liability exposure because they involve managing the project planning, design and construction as the Owner's agent and are less involved in the details of construction.

Construction management services bring the consulting firm closer to the actual construction work where many liability claims occur. To limit consulting firm services to professional ones, all contractors working on the

project must have prime construction contracts written directly with the Owner, or must be subcontractors working under a prime contractor. The consulting firm provides general coordination and direction of the work of the various prime contractors, but they are responsible for their performance, subcontractors and workmen.

Appropriate Owner-Consultant contract documents for project and construction management services are needed. Because of the wide variations in scope of services provided, each firm will probably have to adapt general documents to the specific situation. Such contracts should be carefully reviewed by legal counsel to avoid unintended exposure. Firms should also review their professional and general liability insurance to be sure they understand policy limitations and applicability to project and construction management services.

If the consulting firm is required to provide some direct general construction effort as a part of the project management or construction management services, the firm cannot provide these directly and be protected by its professional liability insurance. In such cases, it may be necessary to form a separate corporation or associate with a general contractor. Again, the ramifications are many and competent counsel should be obtained.

Compatibility with Conventional Design Services

Because project management and construction management services involve experience and expertise in disciplines different from those involved in conventional design work, most consulting firms will need to adapt organizational structure to include these capabilities. The staff members involved in design services will, for the most part, be different from those involved in project and construction management. Aside from the difference in background and expertise required, the use of different people is necessary to provide the necessary interdisciplinary dialogue and interchange which forges optimal solutions.

Hence, a consulting firm may establish a construction management organizational unit and perhaps a project management organizational unit within the firm where previously these did not exist. Such units should be separate from the design unit or units.

Aside from organizational adaptations, project and construction management services are very compatible with normal practice and organizational procedures of consulting firms. Since these, like design services, are professional services, the same philosophies are involved and consistent accounting, personnel, and management policies are appropriate.

As already mentioned, the availability of project and construction management expertise within the firm will, in fact, tend to enhance performance capability in design areas because of increased competence in disciplines which are a normal, though not a major component of conventional design services.

Role of Small Firms

Because of the nature of project and construction management services, this capability is most readily provided by moderate to large firms. In most cases, firms doing only interprofessional work would have limited opportunities to offer project or construction management services. However, small firms that have prime design contracts with clients can, in certain circumstances, offer limited project management and/or construction management services. For example, the conventional scope of design services might be expanded by including services such as the following:

1. An analysis of new plant and equipment available to determine if they will produce desired results.
2. A feasibility study to determine most desirable plan of development.

3. Development of a detailed implementation program for the project.
4. Selecting and retaining other consultants as required to augment the capability of the prime consulting firm.
5. Receive bids and order in the Owner's name all long lead items.
6. Receive bids or negotiate prime contractors.
7. Maintain a system of cost accounting and cost control throughout the project.
8. Provide appropriate construction inspection.
9. Assist all prime contractors in work scheduling.
10. Assist the Owner and contractors in start-up and testing.
11. Train Owner's personnel in operation of the new facility.

A program such as this is within the capability of most consulting firms and is applicable to many project sizes.

It may be appropriate for smaller consulting firms to associate with others on a project-by-project or continuing basis in order to provide the full range of disciplines needed for project and construction management services.

Conclusion

As with any development of new capability, a consulting firm incurs risks in moving into project and construction management services. These include the costs of building capability, the problems of finding and developing competent personnel, and increased exposure to misunderstanding and liability because of new and broader services. Nevertheless, project management and construction management services offer many advantages to the Owner and, hence, market opportunities. Unless consulting firms take the initiative to

expand and provide these professional services, the void will be filled by other non-professional organizations, and a valuable market opportunity will be lost.

Consulting firms should offer project management and construction management services providing they are willing to accept the risks and take the necessary steps to assure that the services are competently rendered in the Owner's interest.

V - HOW TO OFFER PROJECT AND CONSTRUCTION MANAGEMENT SERVICES

Market Analysis

Consulting firms considering project and construction management services should first analyze their particular market situation and opportunities. What are the needs of clients presently served by the firm? What are the needs of prospective clients within the firm's present or planned service area? Do these needs indicate a market opportunity for project and construction management services?

What is the consulting firms present market position? What steps are necessary to move from this position to be able to develop market opportunities? What costs are involved in developing and marketing the capability to provide project and construction management services?

Individual circumstances vary widely. The only general rule is that any decision to offer project and construction management services should be based on a thorough and realistic market analysis. Outside advice may be helpful in this evaluation.

Development of Capability

A consulting firm which decides to enter the project and construction management field must develop necessary capability to perform competently. Realism is vital in evaluating present and future staff capability.

Key members of the project team providing project and construction management services are the Project Manager, Construction Manager, and Design Manager. Most consulting firms have substantial experience in design management and present capability will probably be adequate, at least initially, in the design management area.

However, it may be necessary to add or develop competent project managers and construction managers. The principal qualifications to be considered for these positions are: training, experience, knowledge, expertise in the construction industry and design professions including general overall knowledge and demonstrated capability to manage large projects. The Construction Manager in particular should have strong background and experience in on-site construction activity.

In addition, the consulting firm will need to assure capability in a number of areas which may not be a major part of its basic design work. These include:

1. Scheduling, with particular emphasis on construction work and the use of network based management systems such as CPM and PERT and related computer capabilities.
2. Cost control, with emphasis on detailed quantity and cost estimating procedures, cost management and reporting systems and related computer capability.
3. Inspection capability to handle fabrication and on-site quality assurance, including capability and quality control systems, reporting and evaluation techniques.
4. Safety capability as required to develop and recommend safety programs as related to construction work.
5. Value analysis to optimize cost effectiveness.
6. Constructibility, including planning of site construction facilities and knowledge of construction procedures and sequences to provide input to the design process.

Some portion of these capabilities may already be present. But unless the consulting firm is already doing substantial practice in project and construction management services, significant additions of capability will be required.

Attention is also needed to internal organization of the firm. Organization and procedures need to be developed so that the multiple discipline teams involved in project and construction management function, relate, and integrate effectively to optimize project results. It is suggested that different organizational units for construction management, project management, and design management capability be established to be sure that competence in each of these areas is not diluted or diverted. Any organizational changes should be handled in such a way that ongoing design activities are not jeopardized.

Market Development

Concurrent with the building of performance capability, the consulting firm will need to develop the identified market opportunities. Procedures will depend on the types of client being developed and the general new business practices of the firm. Normally, new business activities will include: continuing evaluation of market opportunities, periodic visits and presentations by principals and senior staff members, preparation of brochures and materials showing experience and capability of the firm, and expeditious handling of project leads and referrals.

It is generally easier to expand the scope of services offered to existing clients than to find and develop new clients. All market development efforts should be directed toward serving the best interests of the clients.

Flexibility

A major advantage of project and construction management is flexibility. To provide flexibility, the scope of services and the project team organization must be tailored to the specific project and owner situation. Clients will have varying internal capabilities and the services of the consulting firm must complement this capability. This requires a sound understanding of the client's situation and needs.

Flexibility also requires development of specific responsibilities and administrative procedures for each project. Areas that should be discussed and agreed between the client and the consulting firm include:

1. Definition of the functions and responsibilities which will be carried by the consulting firm.
2. Definition of the client role including the functions and responsibilities he will handle with in-house staff, and the areas in which he will retain decision or approval authority.
3. Establishment of the integrated project team organization showing inter-relationships between client and consulting firm staff. Key project team assignments, particularly those at interfaces between organizations, should be made.
4. Development of responsibilities and coordination procedures with respect to project communications, administration, accounting, purchasing, approvals, reports, and distribution of reports and materials.
5. Establishment of procedures for design services, selection and purchase of equipment items and materials, and selection and contracting for construction work.
6. Definition of the general scope of the project and procedures for reviewing and approving any changes in that scope. This would include a preliminary budget and schedule.

Many of these matters will need to be discussed at some length in order to prepare the professional service contract for the project and construction management services. Others will be developed in the initial stages of work on the project.

Full communication and understanding of responsibilities and procedures is facilitated by the preparation of a Manual of Procedure early in the project. Such a manual includes comprehensive statements of operating procedures,

standard forms, communications flow pattern, submittal schedules and authority for various aspects of the project. These are all areas which must be fully understood and a Manual of Procedure helps assure this.

Fee Structure

Because the scope of project and construction management services is flexible, flexibility is also needed in fee levels. A number of different fee structures have been used, including:

1. A lump sum fee for a precisely defined scope of services. This is seldom possible with project and construction management.
2. A fee computed as a percentage of construction cost for situations where the scope of services is precisely defined.
3. An hourly fee for actual time spent in project and construction management services plus reimbursement of out-of-pocket costs.
4. A lump sum fee to include a certain portion of the project management and construction management services (commonly the Project Manager, Construction Manager, and office engineering effort) plus reimbursement of costs including overheads for field based members. This approach is currently used by GSA for construction management services.
5. Cost plus fixed fee for services rendered where cost is defined as payroll cost plus overhead plus reimbursable expense.

Because of flexibility in services rendered, fee structures similar to Types 3, 4, and 5 above are preferable. Many variations are possible.

It is hazardous to apply general rules to fee levels for project and construction management services because of wide variations in scope of service.

Nevertheless, some rules of thumb for general guidance may be helpful. It should first be recognized that fees for project management and construction management services are in addition to and do not replace or reduce the fees appropriate for basic design services. A number of suggested fee schedules for design services are available. Fees for usual project management and construction management services will normally range in the vicinity of half to two-thirds of the fee for basic design services, or 3% to 5% of construction cost.

The Association of Professional Engineers of the Province of Ontario has developed a suggested scale of fees for project management services (defined to include both project management and construction management). This publication suggests that fees be computed following either Type 3 or 5 as defined above. Payroll cost multipliers for developing hourly fees, appropriate overhead percentages and fixed fee percentages are consistent with those generally used in consulting practice.

The fee for each particular engagement must be specifically negotiated to suit the scope of services being rendered.

Client Relationships

Sound client relationships are especially important when providing project and construction management services. Full and free communication and a thorough understanding of functions, roles, and responsibilities must be encouraged and developed from the outset. This requires strong attention from both client and consulting firm personnel.

The contract for professional services, the Manual of Procedure, and all facets of day-to-day communications need proper attention to assure that misunderstandings do not develop. With project and construction management

services, personnel from both the client and the consulting firm are merged to form an integrated project team committed to successful project implementation. Such a project team functions best in an atmosphere of mutual understanding and trust.

VI - SUMMARY

Based on committee investigations, we draw the following conclusions:

1. Project and construction management services are increasingly being used in the implementation of significant construction projects.

2. While confusion over definitions persists, three functional roles, Project Manager, Design Manager, and Construction Manager, seem to be emerging.

   The Project Manager directs the efforts of the Design Manager and Construction Manager, and supervises additional areas of concern such as feasibility, site selection, real estate, financing, accounting, tenant and leasing activity.

   The Design Manager supervises conventional basic design services.

   The Construction Manager supervises activities related to scheduling, cost control, value analysis, contract interfacing, quality control, and similar construction related matters. He provides construction related input to the design process, as well as general direction of contractors during the construction activity.

   These are professional services which are not in the construction contract tier. Construction, materials and equipment contracts are between the Owner and the contractors.

3. The Owner's interests are served effectively by project and construction management services provided by independent consulting firms. Advantages to the Owner include: professional independence of project and construction management services, single professional responsibility, high flexibility, improved schedule performance through phased construction, adaptability to systems construction, stronger management of the project, construction oriented input to design, improved quality control, and reduced costs.

4. These are appropriate services for independent consulting firms. Consulting firms willing to take the necessary steps and devote the necessary effort to assure competent performance of these services should move into this field.

5. Project and construction management services provided by consulting firms offer the advantages and avoid the disadvantages of the turn-key approach.

6. Firms able to render project and construction management services will enhance their competitive position, both with respect to other consulting firms and turn-key organizations.

7. In providing these services, consulting firms can expect vigorous competition from others, including competition from general contractors for construction management services.

8. The decision to offer project and construction management services should be based on a sound analysis of market opportunities and the capability and objectives of the consulting firm. This move involves adding disciplines to the firm's capability and incurs costs and risks.